THREADED CHILD-RESISTANT PACKAGE HAVING LINERLESS CLOSURE

The present invention is directed to child resistant container and closure packages that resist opening by a child, and more particularly to a so-called push-and-turn package in which the closure is pushed axially against the container finish to permit rotation for removal.

Background and Summary of the Invention

It is a general object of the present invention to provide a child resistant container and closure package, and a container and a closure for such a package.

In accordance with a first aspect of the present invention, a child-resistant package includes a container having a finish with an open mouth, at least one external thread adjacent to the open mouth, and at least one external radial projection spaced from the open mouth. The package also includes a closure having a base wall, a skirt with at least one internal thread adjacent to the base wall for engagement with the at least one external thread to thread the closure onto the finish, at least one internal locking lug on a side of the at least one internal thread spaced from the base wall, and an annular wall extending from the base wall at a position spaced radially inwardly from the skirt for resilient internal engagement with the open mouth of the container. The at least one internal locking lug is engageable with the at least one radial projection when the closure is fully threaded onto the finish of the container and resiliency of the annular wall holds the at least one internal locking lug in engagement with the projection.

A child-resistant closure in accordance with a second aspect of the present invention includes a base wall, and a skirt with at least one internal thread adjacent to the base wall for engagement with at least one external thread on a container finish to thread the closure onto the container finish. An annular wall extends from the base wall at a position spaced radially inwardly from the skirt for resilient internal engagement with an open mouth of the container finish. At least one internal locking lug is disposed on the skirt spaced from the base wall. The at least one internal locking lug is engageable with an external projection on a container finish, when the closure is fully threaded onto the container finish, and resiliency of the annular wall holds the at least one infernal locking lug in engagement with the external projection.

A container in accordance with a third aspect of the present invention includes a finish with an open mouth defined at least in part by an internal tapered surface. At least one external thread is disposed adjacent to the open mouth, and at least one external radial projection is disposed on a side of the thread spaced from the open mouth. The at least one external radial projection has a cam surface for interengagement with a cam surface of an internal locking lug of a closure.

Brief Description of the Drawings

The invention, together with additional objects, features, advantages and aspects thereof, will be best understood from the following description, the appended claims and the accompanying drawings, in which:

Figure 1 is a fragmentary sectional view of a closure and container package according to one exemplary embodiment of the present invention;

Figure 2 is a fragmentary exploded view of the closure and container package of Figure 1;

Figure 3 is a sectional view taken substantially along line 3-3 of Figure 1;

Figure 4 is an enlarged view of the portion of Figure 1 within the circle 4;

Figure 5 is an enlarged view of the portion of Figure 1 within the circle 5;

Figure 6 is an enlarged sectional view of the closure and container package taken substantially along line 6-6 of Figure 3;

Figure 6A is a modified view of the closure and container package of Figure 6 illustrating a portion of a container and a portion of a closure which are in initial engagement with one another;

Figure 6B is a modified view of the closure and container package of Figure 6A illustrating the portion of the container and the portion of the closure which have been rotated past one another;

Figure 6C is a modified view of the closure and container package of Figure 6 illustrating the portion of the container being axially and circumferentially displaced in a counter-clockwise direction with respect to the portion of the closure;

Figure 7 is a sectional view of the closure of Figure 1;

Figure 8 is bottom plan view of the closure of Figure 7;

Figure 9 is a sectional view of the closure of Figure 7, taken along line 9-9;

Figure 10 is a sectional view of the closure of Figure 9, taken along line 10-10;

Figure 11 is a sectional view of the closure of Figure 9, taken along line 11-11;

Figure 12 is a fragmentary elevational view of the container of Figure 1;

Figure 13 is a top plan view of the container of Figure 1;

Figure 14 is a fragmentary elevational view of the container of Figure 1, that is clocked one-quarter turn compared to the view of Figure 12; and

Figure 15 is an enlarged fragmentary elevational view of a portion of the container of Figure 1.

Detailed Description of Preferred Embodiments

Figures 1 and 2 illustrate a child-resistant closure and container package 20 in accordance with a presently preferred embodiment of the invention as including a closure 22 threadingly secured to a container 24. The present invention is a so-called push-and-turn package, in which the closure 22 is pushed axially against the container 24 to overcome a spring-bias force to permit rotation of the closure 22 for removal from the container 24. The spring-bias force is provided without the use of a liner (not shown) that would typically be separately attached to the closure 22. As such, the present invention involves use of a linerless closure 22.

The container 24 is of one-piece integrally molded plastic construction having a closed bottom or base (not shown), a sidewall 26 extending axially away from the base, and a generally cylindrical finish 28 extending axially away from the sidewall 26. The diameter of the finish 28 is smaller than that of the sidewall 26, and the finish 28 is connected to the sidewall 26 by a shoulder 30. Just axially displaced from the shoulder 30, there are formed at least one, and preferably four external radially extending lugs or child-resistant projections 32. Likewise, just axially displaced from the projections 32, there is formed at least one external thread 34 that extends partially around the circumference of the finish 28. The finish 28 axially terminates in an end 36, which is connected to an inner surface 38 of the finish 28 by a tapered surface 40, which at least partially defines an open mouth of the container 24.

Figures 12 through 14 further illustrate the threads 34 and projections 32 of the finish 28 of the container 24. Figure 13 also illustrates the inner surface 38, the tapered surface 40, and the end 36 of the finish 28. Figure 15 shows one of the projections 32 having

an axial leg portion 42 at a counterclockwise end of a flange or tangential leg portion 44. The axial leg portion 42 includes a circumferentially-facing thread stop surface 46, an axially-facing bottom surface 48, and a cam surface 50 extending therebetween. The tangential leg portion 44 of the projection 32 includes a circumferentially-facing child-resistant stop surface 52 disposed opposite of the thread stop surface 46 and that extends between the bottom surface 48 and an axially-facing child-resistant retaining surface 54.

Referring again to Figures 1 and 2, the closure 22 is of plastic construction, and includes a transversely extending base wall 56, a spring member or inner annular wall 58 depending axially away from the base wall 56 for resilient internal engagement with the open mouth of the container 24, and an outer annular skirt 60 depending axially away from the base wall 56 for fastening the closure 22 to the finish 28 of the container 24. The inner annular wall 58 is disposed radially inwardly of the skirt 60 and extends generally axially, but is also reverse tapered such that it angles radially outwardly from the base wall 56 to an open end 62. The skirt 60 includes at least one internal thread 64 adjacent to the base wall 56 for engagement with the external thread 34 of the container 24 to thread the closure 22 onto the finish 28 of the container 24. The skirt 60 further includes an enlarged skirt portion 66 having an outer surface 68 and axially terminating the skirt 60 at an open end 70 opposite of the base wall 56. The enlarged skirt portion 66 is connected to the rest of the skirt 60 by an outer shoulder 72 and an inner shoulder 74. Proximate to the open end 70, there extends radially inwardly at least one child resistant lug or locking lug 76, and proximate to the inner shoulder 74 there radially inwardly extends at least one stop lug 78 for preventing overthreading or overtightening of the closure 22 onto the container 24. The locking lug 76 on the closure 22 circumferentially engages the corresponding radially extending projection 32 on the container 24 when the closure 22 is fully threaded onto the finish 28 of the

container 24, and resiliency of the inner annular wall 58 biases the locking lug 76 into axial engagement with the projection 32, as will be further described below.

Figures 7 through 11 further illustrate the various features of the closure 22 in finer detail. For example, Figure 7 shows the inner annular wall 58 having an outer surface 80 disposed opposite of an inner surface 82, the open end 62, and an angled cam surface 84 extending therebetween. Figure 7 also serves to illustrate the axial relationship between the locking lugs 76 and the stop lugs 78, wherein the locking lugs 76 are positioned just axially above the end 70 of the enlarged skirt portion 66 and the stop lugs 78 are positioned just axially below the inner shoulder 74. Accordingly, the stop lugs 78 are positioned just axially above the locking lugs 76.

Figure 8 illustrates a bottom plan view of the closure 22. Working radially outwardly, there is shown the inner annular wall 58 having the inner surface 82, the open end 62, the cam surface 84, and the outer surface 80. Also shown are the threads 64, and the locking lugs 76 and stop lugs 78 with circumferentially disposed gaps 86 therebetween wherein the projections 32 (FIG. 2) of the container finish 28 reside when the closure 22 is fastened to the container 24. Finally, the open end 70 and outer surface 68 of the enlarged skirt portion 66 are shown.

Figure 9 further illustrates the axial relationship between the stop lugs 78 and the locking lugs 76, wherein the enlarged skirt portion 66 and stop lug 78 are shown in cross-section and the locking lug 76 is shown in solid. The locking lug 76 includes a circumferentially-facing child-resistant stop surface 88, a radially inner surface 90 connected to the stop surface 88, and an angled surface 92 connected to the radially inner surface 90. The locking lug 76 also includes an axial retaining surface 94 and an angled cam surface 96 connected thereto for engagement with the projection 32 on the finish 28 of the container 24 (FIG. 1).

The axial retaining surface 94 and the radially inner surface 90 of the locking lug 76 are also shown in Figure 10, wherein the locking lug 76 integrally extends radially inwardly from the enlarged skirt portion 66. As can also be seen in Figure 10, as well as Figure 9, the stop lug 78 includes a circumferentially-facing thread stop surface 98 that is connected to a radially inner surface 100 and that engages the projection 32 on the finish 28 of the container 24 (FIG. 1). As shown in Figure 11, the radially inner surface 90 extends axially downwardly from the inner shoulder 74 of the skirt 60 and the thread stop surface 98 extends radially inwardly from the enlarged skirt portion 66.

Referring again to Figures 1 and 2, the closure 22 is applied to the container 24 by aligning the enlarged skirt portion 66 of the closure 22 over the finish 28 of the container 24 and rotating the closure 22 with respect thereto, such that the threads 64 of the closure 22 threadingly engage the threads 34 on the finish 28 of the container 24. Continued rotation of the closure 22 will eventually lead to initial engagement of the inner annular wall 58 of the closure 22 with the open mouth of the container 24. As also depicted in Figure 5, the angled surface 84 of the inner annular wall 58 of the closure 22 sealingly engages the corresponding angled surface 40 of the finish 28 of the container 24 to ensure circumferential surface contact sealing between the closure 22 and the container 24. As such, no separate liner member of any kind is needed be attached to the closure 22 for sealing purposes. As the closure 22 is threaded toward the container 24, the angled surface 40 on the finish 28 tends to compress the inner annular wall 58 in a radially inward direction, thereby creating resistance to further axial displacement of the closure 22. Thus, the mating taper arrangement will have the effect of biasing the closure 22 in an axial direction away from the container 24. In turn, and referring again to Figure 1, this biasing effect urges the locking lugs 76 of the closure 22 into upward axial engagement with the projections 32 of the finish 28 of the container 24, until such biasing effect is overcome by a downward force imposed on the closure 22 at

which time the closure 22 can be unthreaded from the container 24, as will be discussed in more detail below. In other words, the inner annular wall 58 is flexibly engageable with the tapered surface 40 of the container 24 under a diametrical interference fit, whereby such fit yields a bias force on the inner annular wall 58 thereby generating a resultant upward axial force that tends to maintain the locking lug 76 in substantial circumferential alignment with the projection 32 of the container 22.

Continued rotation of the closure 22 with respect to the container 24 will also lead to initial engagement between the locking lugs 76 of the closure 22 and the radial projections 32 of the finish 28. Specifically, as shown in Figure 6A, the cam surface 96 of the locking lug 76 of the closure 22 initially engages the cam surface 50 of the radial projection 32. As the closure 22 is further rotated, the locking lug 76 passes under the radial projection 32 by virtue of the cooperating cam surfaces 50, 96 and, as shown in Figure 6B. The stop surface 98 of the stop lug 78 eventually engages the stop surface 46 of the projection 32 so as to stop rotation of the closure 22 and thereby prevent overthreading and resulting damage to the closure 22. Specifically, the stop lug 78 prevents overtightening whereby the inner annular wall 58 (FIG. 1) becomes overstressed and permanently deformed. As also shown in Figure 6B, the locking lug 76 passes almost entirely beyond the radial projection 32, but not quite. Rather, the locking lug 76 is shown axially covered or entrapped by the tangential leg portion 44 of the radial projection 32, wherein there is shown an axial space between the retaining surfaces 54, 94 that is the result of downward pressure being applied to the closure 22 as it is fastened to the container 24 (FIG. 1).

Figure 6 illustrates the closure and container package 20 in a closed state of rest after application of the closure 22, wherein the tangential leg portion 44 of the projection 32 axially entraps the locking lug 76 and the child-resistant stop surface 52 of the projection 32 circumferentially stops the locking lug 76 in a counter-clockwise rotational direction, such

that the closure 22 cannot be removed. Figure 4 illustrates the same closed state of rest as Figure 6, wherein the radial projection 32 is circumferentially entrapped between the stop lug 78 and the locking lug 76 and wherein the locking lug 76 is axially entrapped in an upward direction by the tangential leg portion 44 of the radial projection 32. Figure 3 further illustrates the closed state of rest wherein it is clear that the radial projections 32 prevent counter-clockwise displacement of the locking lugs 76.

Referring again to Figure 1, the closure 22 cannot be removed from the container 24 merely by rotating the closure 22 in a counter-clockwise direction. Rather, the closure 22 is removed from the container 24 by first imposing a downward force on the closure 22 to overcome the upward bias force created by the interengaged inner axial wall 58 and the open mouth of the closure 22 and container 24 respectively. Such downward force enables axial displacement of the closure 22 with respect to the container 24 into axial spaces 33 between the threads 64 of the closure 22 and the threads 34 of the container 24. Referring now to Figure 6C, by virtue of the axial displacement described above, the locking lug 76 may now rotate counter-clockwise and freely pass beneath the radial projection 32. As shown in Figure 2, the closure 22 may be unthreaded and removed from the container 24.

There have thus been described a closure 22, a container 24, and a closure and container package 20 that fully satisfy all of the objects and aims previously set forth. The present invention has been disclosed in conjunction with presently preferred embodiments thereof, and a number of modifications and variations have been discussed. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art in view of the foregoing description. The invention is intended to embrace all such modifications and variations as fall within the spirit and broad scope of the appended claims.